UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

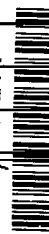| Attorney Docket No.	35.C14936
First Named Inventor or Application Identifier	
YASUHIRO HARADA	
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. [X] **Fee Transmittal Form**
(Submit an original, and a duplicate for fee processing)

2. [ ] Applicant claims small entity status.
See 37 CFR 1.27.

3. [X] Specification   *Total Pages* **28**

4. [X] Drawing(s) *(35 USC 113)*   *Total Sheets* **6**

5. [X] Oath or Declaration   *Total Pages* **1**

   a. [X] Newly executed (original or copy)

   b. [ ] Copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 17 completed)
[Note Box 6 below]

      i. [ ] <u>DELETION OF INVENTOR(S)</u>
Signed Statement attached deleting
inventor(s) named in the prior application, see
37 CFR 1.63(d)(2) and 1.33(b).

6. [X] Application Data Sheet. See 37 CFR 1.76

7. [ ] CD-ROM or CD-R in duplicate, large table or Computer Program *(Appendix)*

8. [ ] Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*

   a. [ ] Computer Readable Form (CRF)

   b. Specification Sequence Listing on:

     i. [ ] CD-ROM or CD-R (2 copies); or

     ii. [ ] paper

   c. [ ] Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. [X] Assignment Papers (cover sheet & document(s))

10. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)*   [ ] Power of Attorney

11. [ ] English Translation Document *(if applicable)*

12. [ ] Information Disclosure Statement (IDS)/PTO-1449   [ ] Copies of IDS Citations

13. [ ] Preliminary Amendment

14. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*

15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*

16. [ ] Other: _____

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17. If a CONTINUING APPLICATION, *check appropriate box and supply the requisite information:*

[ ] Continuation   [ ] Divisional   [ ] Continuation-in-part (CIP)   of prior application No. ___/_____

Prior application information: *Examiner* _____   *Group/Art Unit:* _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation <u>can only</u> be relied upon when a portion has been inadvertently omitted from the submitted application parts.

18. CORRESPONDENCE ADDRESS

[X] Customer Number or Bar Code Label   **05514** (Insert Customer No. or Attach bar code label here)   or [ ] Correspondence address below

NAME	
Address	
City		State		Zip Code	
Country		Telephone		Fax	

DC_MAIN 42713 v 1

CLAIMS	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
	TOTAL CLAIMS (37 CFR 1.16(c))	21-20 =	1	X $ 18.00 =	$ 18.00
	INDEPENDENT CLAIMS (37 CFR 1.16(b))	5-3 =	2	X $ 80.00 =	$ 160.00
	MULTIPLE DEPENDENT CLAIMS (if applicable) (37 CFR 1.16(d))			$270.00 =	$ 0.00
				BASIC FEE (37 CFR 1.16(a))	$ 710.00
				Total of above Calculations =	$ 888.00
	Reduction by 50% for filing by small entity (Note 37 CFR 1.9, 1.27, 1.28).				
				TOTAL =	$ 888.00

19. Small entity status

    a. ☐   A small entity statement is enclosed

    b. ☐   A small entity statement was filed in the prior nonprovisional application and such status is still proper and desired.
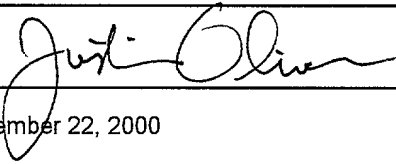
    c. ☐   Is no longer claimed.

20. ☒ A check in the amount of $ 888.00 to cover the filing fee is enclosed.

21. ☒ A check in the amount of $ 40.00 to cover the recordal fee is enclosed.

22. The Commissioner is hereby authorized to credit overpayments or charge the following fees to Deposit Account No. 06-1205:

    a. ☒ Fees required under 37 CFR 1.16.

    b. ☐ Fees required under 37 CFR 1.17.

    c. ☐ Fees required under 37 CFR 1.18.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED	
NAME	Justin J. Oliver - Reg. No. 44,986
SIGNATURE	*(signature)*
DATE	November 22, 2000

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DC_MAIN 42713 v 1

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APPLICATION INFORMATION

Title Line One: FLUCTUATION DETECTING APPARATUS AND APPARATUS WITH FLUCTUATION
Title Line Two: DETECTING FUNCTION

Total Drawing Sheets: 6
Formal Drawings?: Yes
Application Type: Utility
Docket Number: 35.C14936
Secrecy Order in Parent Appl.?: No

REPRESENTATIVE INFORMATION
Representative Customer Number: 5514

PRIOR FOREIGN APPLICATIONS

Foreign Application One: 11-333728
Filing Date: 11-25-1999
Country: JAPAN
Priority Claimed: Yes

Fluctuation Detecting Apparatus and

Apparatus with Fluctuation Detecting Function

BACKGROUND OF THE INVENTION

5   Field of the Invention

This invention relates to a fluctuation detecting

apparatus having the function of calculating a signal

corresponding a distance and fluctuation data, and an

apparatus with the fluctuation detecting function.

10   Related Background Art

There have heretofore been proposed cameras which

effect fluctuation detection by the utilization of

automatic focus detecting apparatuses as shown in

Japanese Patent Application Laid-Open No. 58-4109 and

15   Japanese Patent Publication No. 5-10603. These cameras

effect fluctuation detection by the use of an image

pickup element (hereinafter referred to as the AF

sensor) the automatic focus detecting apparatus has,

and use correlative calculation for image data at a

20   certain time and image data after the lapse of a

predetermined time to thereby find the fluctuation

amount of the camera.

On the other hand, in recent years, there has been

proposed a camera capable of effecting multipoint

25   distance measurement which can measure the object

distance in a plurality of areas in a photo-taking

image field. Cameras carrying the above-described

fluctuation detecting function on such a camera capable
of effecting multipoint distance measurement have also
been proposed in Japanese Patent Application Laid-Open
No. 4-349439, etc. In these cameras capable of

5   effecting multipoint distance measurement and moreover
effecting fluctuation detection by the use of the AF
sensor, fluctuation detection is effected on the basis
of the image data of the AF sensor corresponding to
each area (distance measuring point) on which the

10   distance of a main object is measured. Accordingly,
fluctuation correction is effected by the use of this
fluctuation data, whereby accurate fluctuation
correction becomes possible for the main object.

In the fluctuation detection utilizing the above-
15   described conventional AF sensor, the fluctuation of
the camera is detected as the image fluctuation amount
on the surface of the AF sensor and therefore, whether
the detected fluctuation component of the camera is due
to the shift fluctuation of the camera in translation

20   directions X and Y or due to the rotation fluctuation
in pitch direction P and yaw direction Y cannot be
distinguished. Accordingly, when fluctuation
correction is to be effected on the basis of the
detected fluctuation amount, a fluctuation amount

25   comprising sum of a shift fluctuation component and a
rotational fluctuation component is corrected without
fail. The rotation fluctuation component is constant

in its influence upon the image fluctuation on the surface of the sensor irrespective of the distance of the object, whereas the influence of the shift fluctuation component is varied in the influence on the

5 surface of the sensor by the distance of the object and therefore, when objects differing in distance existed in the photo-taking image field, if detection was effected without the shift fluctuation component and the rotational fluctuation component being separated

10 from each other and fluctuation correction was effected on the basis of that fluctuation amount, accurate correction could not be effected for the objects differing in distance.

SUMMARY OF THE INVENTION

15 One aspect of this invention is to detect an image signal for an object in each of a plurality of areas, and judge from this image signal whether an object located at a long distance is mixed with an object

20 located at a short distance, and to provide a fluctuation detecting apparatus having a fluctuation amount calculating circuit for obtaining, if an object located at a long distance is mixed with an object located at a short distance, fluctuation data from each

25 of the image signal of an area in which the object located at a short distance exists and the image signal of an area in which the object located at a long

distance exists, and calculating a rotational fluctuation amount and a shift fluctuation amount on the basis of these fluctuation data.

One aspect of this invention is to detect an image signal for an object in each of a plurality of areas, and judge from this image signal whether an object located at a long distance is mixed with an object located at a short distance, and to provide an apparatus with the fluctuation detecting function having a fluctuation correction device for obtaining, if an object located at a long distance is mixed with an object located at a short distance, fluctuation data from each of the image signal of an area in which the object located at a short distance exists and the image signal of an area in which the object located at a long distance exists, calculating a rotational fluctuation amount and a shift fluctuation amount on the basis of these fluctuation data, and corresponding to each of the rotational fluctuation amount and the shift fluctuation amount.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing the circuit construction of the essential portions of a camera according to an embodiment of the present invention.

Fig. 2 shows each correction device provided in the camera of Fig. 1.

Fig. 3 shows areas for obtaining measured distance data and fluctuation data in a photo-taking image field in the camera of Fig. 1.

Fig. 4 shows the basic principle in the distance measurement of the camera of Fig. 1.

Fig. 5 shows the basic principle when in the camera of Fig. 1, fluctuation detection is effected by the utilization of an AF sensor.

Fig. 6 is a flow chart showing the operation of that portion of the camera of Fig. 1 which is concerned in fluctuation detection.

Fig. 7 is a flow chart showing the operation of that portion of the camera of Fig. 1 which is concerned in the fluctuation component separating process.

Fig. 8 shows the construction of a circuit for effecting the fluctuation component separating process which is provided in the camera of Fig. 1.

Fig. 9 shows the fluctuation components of the camera of Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will hereinafter be described in detail with respect to an embodiment thereof shown in the drawings.

Fig. 1 is a block diagram showing the circuit construction of the essential portions of a camera as an optical apparatus according to an embodiment of the

present invention.

In Fig. 1, the reference numeral 101 designates a microcomputer (hereinafter referred to as the CPU) which executes the sequence control of the entire

5   camera including lens driving and exposure, and also executes exposure calculation and distance measuring calculation and further, calculation regarding photographing such as calculation concerned with fluctuation detection. The reference numeral 102

10   denotes a multipoint AF sensor (specifically a line sensor) disposed crosswise in horizontal and vertical directions to measure the object distance (absolute distance) in a plurality of areas in a photo-taking images field. The reference numeral 103 designates a

15   sensor control circuit which outputs a signal conforming to the object distance to the CPU 101 on the basis of the result of the detection (measured distance data) by the AF sensor 102, and in this embodiment, fluctuation detection is effected by the use of the

20   output from the AF sensor 102 and therefore, the sensor control circuit 103 also outputs data for fluctuation detection. The reference numeral 104 denotes a photometry sensor which measures the luminance of outdoor daylight during photographing, and effects

25   photometry in conformity with the control signal from the CPU 101.

The reference numeral 105 designates a fluctuation

correction device having correction devices for
independently correcting a shift fluctuation component
and a rotational fluctuation component. Describing the
fluctuation correction device in detail with reference

5 to Fig. 2, the correction device for the rotation
fluctuation component drives a lens A for correction
provided in a portion of a photo-taking lens system so
as to negate image fluctuation in a direction
orthogonal to the optical axis thereof, on the basis of

10 a detected fluctuation amount, to thereby effect
correction. In other words, it is a device for
correcting rotation fluctuation by changing the angle
of incidence of a photo-taking beam incident on a light
receiving surface corresponding to a film surface. On

15 the other hand, the correction device for the shift
fluctuation component drives a movable portion B
provided on the grip portion of a camera in the
horizontal and vertical directions of the camera on the
basis of the detected fluctuation amount and drives the

20 camera in the direction of translation to thereby
effect correction. In other words, it is a device for
correcting shift fluctuation by moving the light
receiving surface and the photo-taking lens as a unit
in the direction of translation.

25 The reference numeral 106 denotes a lens control
portion which effects the control of the ordinary lens
operation such as the driving of a photo-taking lens

107, and the reference numeral 108 designates a memory circuit storing therein necessary data such as the aforementioned measured distance data and data for image fluctuation correction.

Fig. 3 shows areas for measuring the object distance in the photo-taking image field by the AF sensor 102.

In the present embodiment, the camera has five areas, and measured distance data is found in each area. Further, fluctuation detection is effected by the use of the outputs from these areas.

The fluctuation in the horizontal direction is detected by the use of the areas 1, 2 and 3, and the fluctuation in the vertical direction is detected by the use of the outputs of the areas 4 and 5. In this embodiment, the number of the areas for obtaining the measured distance data (for measuring the object distance) is five, but if it is possible to obtain the measured distance data by a plurality of areas, the number of the areas need not be limited to five.

Description will now be made of the fluctuation detecting operation of the camera in the above-described construction.

The fluctuation detection in the present embodiment is one in which a distance measuring system of the so-called phase difference detection type is arranged for the fluctuation detection of the camera,

and Fig. 4 shows the basic principle of the distance measurement by the phase difference detection type.

Incident light passed through a light receiving lens passes through separator lenses 203 and 204 and is imaged on line sensors 201 and 202 (corresponding to the AF sensor 102) disposed at spatially different positions. The phases of two image signals Sa and Sb imaged on these line sensors 201 and 202 are deviated from each other and the difference therebetween is compared, as it were, correlative calculation is effected to thereby detect the image deviation amount between the two images, and calculate the measured distance data. Further, in this embodiment, the line sensor (AF sensor 102) is used for fluctuation detection at the interval between the distance measuring operations. That is, describing with reference to Fig. 5, the image of the object is picked up at different times by one side 301 of the line sensor and correlative calculation is effected on the basis of two obtained image data Ta and Tb, whereby the detection of the amount of deviation in terms of time, i.e., the fluctuation amount by the fluctuation of the camera, is effected. Various propositions have been made regarding this basic principle, and in the present embodiment as well, the image fluctuation amount is detected by a similar principle and therefore, the details thereof need not be described.

The fluctuation component separating process operation started after the half depression of a release button, not shown, i.e., the operation concerned with the fluctuation detection and fluctuation correction of the camera which are the main portions in the present embodiment, will now be described with reference to the flow chart of Fig. 6.

At a step S1, the operation of detecting the fluctuation of the camera is started, and at a step S2, measured distance data corresponding to the areas 1 to 5 obtained by the multipoint AF sensor 102 are read from the memory circuit 108. At the next step S3, on the basis of the measured distance data of the respective areas read at the step S2, whether an object located at a long distance is mixed with an object located at a short distance in the photo-taking image field is judged.

This judgement is executed by storing the threshold value data N of the short distance and the threshold value data F of the long distance in advance in the memory circuit 108, and comparing the threshold value data N and F with the respective measured distance data. Specifically, comparison is effected with the measured distance data in the horizontal direction (areas 1, 2 and 3) and the vertical direction (areas 4 and 5), and when the measured distance data are N or less, the object is judged to be an object

located at a short distance, and as an object located at a short distance, the information of the areas is stored in the memory circuit 108. When the measured distance data are F or greater, the object is judged to be an object located at a long distance, and as an object located at a long distance, the information of the areas is stored in the memory circuit 108. After in this manner, comparison has been effected with all the measured distance data, whether at least one set of an object in the areas from which short distance information has been obtained and an object in the areas from which long distance information has been obtained exist in each of the horizontal and vertical directions is judged. Here, the threshold values need not be fixed values, but may be variable on the basis of the focal length information, etc. of the lens. Also, the threshold values are classified into N used for the judgement of the short distance and F used for the judgement of the long distance, but the same values may be set as the threshold values.

If at the step S3, it is judged that an object located at a long distance is not mixed with an object located at a short distance, advance is made to a step S8, where the separation of the fluctuation components is not effected but the detection of the fluctuation amount is effected. This fluctuation detecting operation is such as described with reference to Fig.

5. Next, advance is made to a step S9, where the driving amount of the fluctuation correction device 105, is found on the basis of the fluctuation amount information detected at the step S8 and the focal

5   length information, and this fluctuation correction device is driven to effect fluctuation correction. For this fluctuation correction, only one of the rotational fluctuation correction device and the shift fluctuation correction device is used. Thereafter, advance is made

10 to a step S10, a series of fluctuation detecting and fluctuation correcting operation are terminated.

If at the step S3, it is judged that an object located at a long distance is mixed with an object located at a short distance, advance is made to a step

15 S4, where a set of areas corresponding to the objects located at a short distance and a long distance are selected in each of the horizontal and vertical directions by the information stored in the memory circuit 108 at the step S3. If there are a plurality

20 of areas corresponding to the objects located at a short distance and a long distance, the area at the nearest side and the area at the farthest side are selected. At the next step S5, fluctuation detection is effected for each area by the use of image data

25 corresponding to each area selected at the step S4. At the next step S6, the separating process is carried out by the use of the fluctuation amount for the objects

located at a long distance and a short distance
obtained at the step S5, and the separation of the
shift fluctuation component in the horizontal and
vertical directions and the rotational fluctuation
5   component in the pitch and yaw directions is effected.

The above-described fluctuation component
separating process utilizes the fact that the
influences given onto the surface of the sensor by the
shift fluctuation component and the rotational
10   fluctuation component differ from each other.
Specifically described, attention is paid to the point
that the rotational fluctuation component gives a
constant influence irrespective of the object distance,
whereas the influence of the shift fluctuation
15   component is great for an object located at a short
distance and is very little for an object located at a
long distance. That is, the image fluctuation amount
of the object located at a short distance can be
regarded as including the rotational fluctuation
20   component and the shift fluctuation component, and the
image fluctuation amount of the object located at a
long distance can be regarded as including only the
rotational fluctuation component and therefore, by
taking the difference between the image fluctuation
25   amounts of the objects located at a short distance and
a long distance, the shift fluctuation component is
found, and consequently the separation of the shift

fluctuation component and the rotational fluctuation
component is realized.

The subroutine of the fluctuation component
separating process executed at this step S6 will now be
described with reference to the flow chart of Fig. 7.

At a step S31, the fluctuation component
separating process is started, and at a step S32, the
fluctuation amounts (fluctuation data) of the objects
located at a short distance and a long distance are
read out from the memory circuit 108. At the next step
S33, difference processing is carried out for the
fluctuation amounts of the object located at a short
distance and the object located at a long distance, and
the separation of the shift fluctuation component and
the rotational fluctuation component is effected. Fig.
8 shows a processing circuit therefor. At a step S34,
the fluctuation component separating process is
terminated, and advance is made to the step S7 of the
main routine.

Turning back to Fig. 6, at the step S7, the
driving amount of the fluctuation correction device 105
is found on the basis of the fluctuation amount of each
component obtained at the step S6, and the correction
device (see Fig. 2) for the correction of the shift
fluctuation component and the rotational fluctuation
component are driven to thereby effect fluctuation
correction. At a step S10, a series of fluctuation

detecting and correcting operations are terminated.

What has been described above is the operation concerned in the fluctuation detections and fluctuation correction according to the embodiment of the present

5 invention.

According to the above-described embodiment, attention is paid to the fact that the image fluctuation amount detected from the image data obtained for the object located at a short distance

10 contains the rotational fluctuation component and the shift fluctuation component, whereas the image fluctuation amount detected from the image data obtained for the object located at a long distance includes only the rotational fluctuation component, and

15 design is made such that the separation of the fluctuation components is effected by taking the difference between the image fluctuation amounts of the object located at a short distance and the object located at a long distance.

20 Specifically, design is made such that for example, whether an object located at a long distance is mixed with an object located at a short distance in the photo-taking image field is judged from the measured distance data of the five areas, and if it is

25 judged that the former object is mixed with the latter object, the areas corresponding to the objects located at a short distance and a long distance are selected,

and fluctuation data is found from the image data in the selected areas, and the shift fluctuation and rotational fluctuation components are separated from each other by the use of this fluctuation data and

5   therefore, when fluctuation detection is to be effected by the use of the AF sensor, it becomes possible to separate and detect the shift fluctuation component in the direction of translation and the rotational fluctuation component in the rotational direction.

10   Also, as shown in Fig. 2, the apparatus of the present invention has the correction device for independently correcting the shift fluctuation component and the rotational fluctuation component and therefore, the shift fluctuation component and the

15   rotational fluctuation component can be separately detected so that accurate correction can be effected on the basis of each of the detected fluctuation components.

While in the above-described embodiment,

20   fluctuation data is obtained by the use of the AF sensor for obtaining measured distance data, this is not restrictive, but a light receiving sensor for exclusive use may be had.

Also, while in the above-described embodiment, a

25   line sensor disposed crosswise is shown as the multipoint AF sensor, a two-dimensional area sensor such as a CCD may also be used.

Also, there has been shown an example in which the fluctuation component separating process is not carried out when the objects at a short distance and a long distance are mixed with each other in neither of the

5   horizontal and vertical directions, but when the two objects are mixed with each other for only one of the two directions, the fluctuation component separating process may be carried out only for that direction.

Also, while there has been shown an example in

10   which when there exist a plurality of areas located at a short distance and a long distance, the areas at the nearest side and the farthest side are selected, the selection of the areas may be effected with such information as the contrast of the image data also

15   added.

Further, while there has been shown an example in which a correction device is independently provided for each fluctuation component and correction is accurately effected for both of the two fluctuation components, a

20   fluctuation component selecting member such as a switch for selecting the fluctuation components (or a member for selecting the correction devices) may be provided so that the fluctuation component to be corrected can be selected. Thereby, it becomes possible to make such

25   design that during the composition changing operation, e.g. the panning operation, of the camera, the detection of the fluctuation component in that

direction is not selected, whereby the panning

operation can be performed smoothly (because it does

not happen that the correction device detects the

panning operation as a fluctuation and acts so as to

5   correct it).

As described above, according to the above-

described embodiment, there can be provided an

apparatus with the fluctuation detecting function

which, can obtain the rotational fluctuation amount and

10   the shift fluctuation amount by the image signal and

even when an object located at a long distance is mixed

with an object located at a short distance and there

exist both of the rotational fluctuation component and

the shift fluctuation component, can effect accurate

15   fluctuation correction for each of the object located

at a short distance and the object located at a long

distance.

Also, there can be provided an apparatus with the

fluctuation detecting function which can correct the

20   fluctuation components without spoiling the operability

for the movement of the apparatus in an intended

direction, and can effect accurate fluctuation

correction for both of the object located at a short

distance and the object located at a long distance.

25   While in the above-described embodiment, there has

been shown an example in which the optical apparatus is

a camera, a digital camera, a video camera and a

compound apparatus of these are also included as the optical apparatus.

Further, any other apparatus having the fluctuation correcting and detecting functions than the above-mentioned optical apparatuses are also included.

5

WHAT IS CLAIMED IS:

1. A fluctuation detecting apparatus including:

a light receiving portion for detecting an image signal for an object in each of a plurality of areas;

5   a judging circuit for judging from the image signal obtained in each of said areas whether an object located at a long distance is mixed with an object located at a short distance; and

a fluctuation amount calculating circuit for
10   independently finding fluctuation data by the use of the image signal of the area in which said object located at a short distance exists and the image signal of the area in which said object located at a long distance exists when said judging circuit judges that
15   the object located at a long distance is mixed with the object located at a short distance, and calculating a rotational fluctuation amount and a shift fluctuation amount on the basis of said fluctuation data.

20   2. A fluctuation detecting apparatus according to Claim 1, wherein said fluctuation amount calculating circuit separates the rotational fluctuation amount and the shift fluctuation amount from the difference between the fluctuation data obtained from the image
25   signal of said object located at a short distance and the fluctuation data obtained from the image signal of said object located at a long distance.

3. A fluctuation detecting apparatus according to
Claim 1, wherein said light receiving portion outputs
image signals corresponding to the absolute distances
to said objects, and said fluctuation amount
5   calculating means finds fluctuation data from the image
signals corresponding to said absolute distances.

4. A fluctuation detecting apparatus including:

a light receiving portion for detecting an image
10   signal for an object in each of a plurality of areas;

a distance calculating circuit for calculating the
distance to the object in each of said areas from the
image signal obtained in each of said areas;

a judging circuit for judging from the distance to
15   the object in each of said areas whether an object
located at a long distance is mixed with an object
located at a short distance; and

a fluctuation amount calculating circuit for
independently finding fluctuation data by the use of
20   the image signal of the area in which said object
located at a short distance exists and the image signal
of the area in which said object located at a long
distance exists when said judging circuit judges that
the object located at a long distance is mixed with the
25   object located at a short distance, and calculating a
rotational fluctuation amount and a shift fluctuation
amount on the basis of said fluctuation data.

5. A fluctuation detecting apparatus according to Claim 4, wherein said fluctuation amount circulating circuit separates the rotational fluctuation amount and the shift fluctuation amount from the difference

5   between the fluctuation data obtained from the image signal of said object located at a short distance and the fluctuation data obtained from the image signal of said object located at a long distance.

10   6. A fluctuation detecting apparatus according to Claim 5, wherein said fluctuation amount calculating circuit makes the difference between the fluctuation data obtained from the image signal of said object located at a short distance and the fluctuation data

15   obtained from the image signal of said object located at a long distance into the shift fluctuation amount.

7. A fluctuation detecting apparatus according to Claim 4, wherein said judging circuit compares the

20   distances to the objects obtained from the image signal of each area calculated by said distance calculating circuit with a threshold value to thereby detect the object located at a short distance and the object located at a long distance.

25

8. A fluctuation detecting apparatus according to Claim 4, wherein said fluctuation amount calculating

circuit selects the nearest object when a plurality of objects located at a short distance are detected by said judging circuit, and selects the farthest object when a plurality of objects located at a long distance

5 are detected, and calculates the fluctuation amount.

9. A fluctuation detecting apparatus according to Claim 1, wherein said light receiving portion is a line sensor.

10

10. A fluctuation detecting apparatus according to Claim 1, wherein said light receiving portion is a two-dimensional area sensor.

15 11. An apparatus with the fluctuation detecting function including:

a light receiving portion for detecting an image signal for an object in each of a plurality of areas;

a judging circuit for judging from the image

20 signal obtained in each of said areas whether an object located at a long distance is mixed with an object located at a short distance;

a fluctuation amount calculating circuit for independently finding fluctuation data by the use of

25 the image signal of the area in which said object located at a short distance exists and the image signal of the area in which said object located at a long

distance exists when said judging circuit judges that the object located at a long distance is mixed with the object located at a short distance, and calculating a rotational fluctuation amount and a shift fluctuation

5   amount on the basis of said fluctuation data;

a first correction device for correcting rotational fluctuation on the basis of the rotational fluctuation amount calculated by said fluctuation amount calculating circuit; and

10   a second correction device for correcting shift fluctuation on the basis of the shift fluctuation amount calculated by said fluctuation calculating circuit.

15   12.   An apparatus with the fluctuation detecting function according to Claim 11, wherein when said judging circuit judges that the object located at a long distance is not mixed with the object located at a short distance, one of said first correction device and

20   said second correction device is driven.

13.   An apparatus with the fluctuation detecting function according to Claim 11, wherein said first correction device corrects the rotational fluctuation

25   by changing the angle of incidence of a beam incident on a light receiving surface, and said second correction device corrects the shift fluctuation by

moving the light receiving surface and an optical
system as a unit.

14. A fluctuation detecting apparatus including:

a fluctuation amount calculating circuit for
detecting a fluctuation state and obtaining a
fluctuation state signal for each of an object located
nearer than a first predetermined distance and an
object located farther than a second predetermined
distance, and calculating a rotational fluctuation
amount and a shift fluctuation amount from the
fluctuation state signal obtained for each object.

15. A fluctuation detecting apparatus according
to Claim 14, wherein said calculating circuit
calculates said shift fluctuation amount from the
difference between the fluctuation state signal
detected for the object located nearer than said first
predetermined distance and the fluctuation state signal
detected for the object located farther than said
second predetermined distance.

16. A fluctuation detecting apparatus according
to Claim 15, wherein a rotational fluctuation amount is
calculated from the fluctuation state signal detected
for the object located farther than said second
predetermined distance.

17. A fluctuation detecting apparatus according to Claim 14, further including:

a light receiving portion for receiving images from said objects; and

5   wherein said fluctuation amount calculating circuit detects the fluctuation state on the basis of the difference between the positions of the images on said light receiving portion at a time interval between the images being received by said light receiving

10   portion.

18. An apparatus with the fluctuation detecting function including:

a fluctuation amount calculating circuit for

15   detecting a fluctuation state and obtaining a fluctuation state signal for each of an object located nearer than a first predetermined distance and an object located farther than a second predetermined distance, and calculating a rotational fluctuation

20   amount and a shift fluctuation amount from the fluctuation state signal obtained for each object;

a first correction device for correcting the angle of incidence of a beam incident on a light receiving surface on the basis of the rotational fluctuation

25   amount obtained by said fluctuation amount calculating circuit; and

a second correction device for moving the light

receiving surface and an optical system as a unit is the direction of translation on the basis of the shift fluctuation amount obtained by said fluctuation amount calculating circuit.

5

19. An apparatus with the fluctuation detecting function according to Claim 18, wherein when said objects are single, one of said first and second correction devices is operated by the fluctuation state

10 signal obtained for said object.

20. An apparatus with the fluctuation detecting function according to Claim 18, wherein said first correction device corrects rotational fluctuation by

15 changing the angle of incidence of the beam incident on the light receiving surface, and said second correction device corrects shift fluctuation by moving the light receiving surface and the optical system as a unit.

20 21. An apparatus with the fluctuation detecting function according to Claim 11, which is a camera.

ABSTRACT OF THE DISCLOSURE

A fluctuation detecting apparatus includes a light receiving portion for detecting an image signal for an object in each of a plurality of areas, a judging circuit for judging from the image signal obtained in each of the areas whether an object located at a long distance is mixed with an object located at a short distance, and a fluctuation amount calculating circuit for independently finding fluctuation data by the use of the image signal of the area in which the object located at a short distance exists and the image signal of the area in which the object located at a long distance exists when the judging circuit judges that the object located at a long distance is mixed with the object located at a short distance, and calculating a rotational fluctuation amount and a shift fluctuation amount on the basis of the fluctuation data.
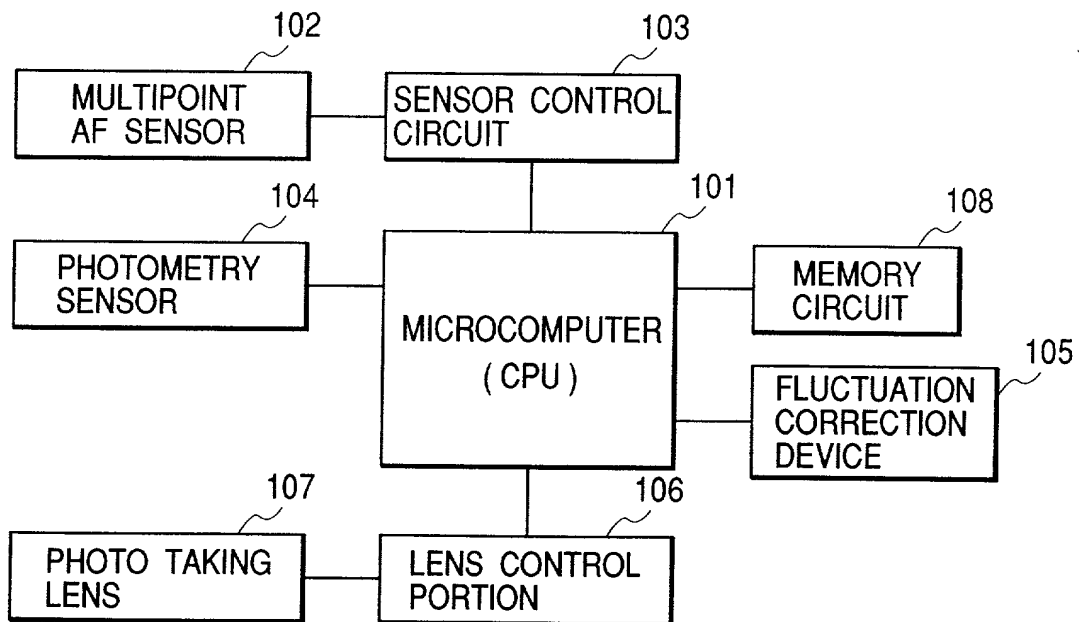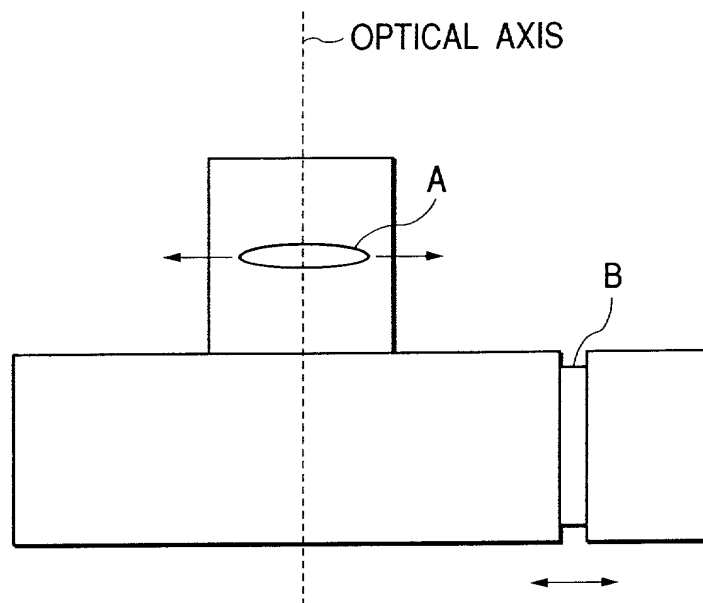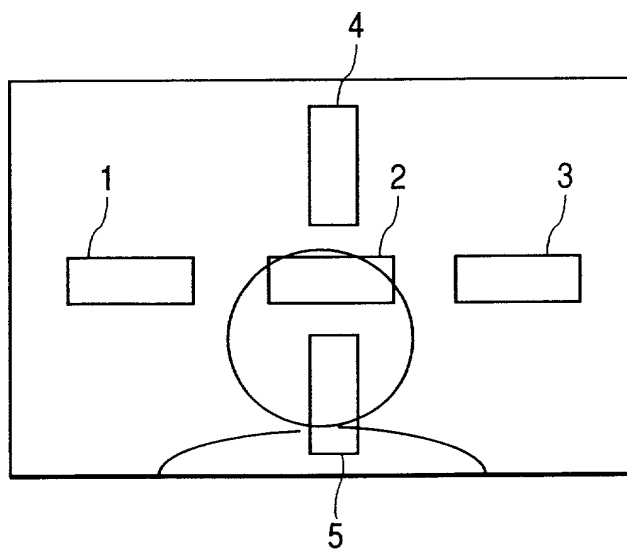
FIG. 1

FIG. 2

OPTICAL AXIS

A

B

FIG. 3

4

1

2

3

5

FIG. 4

204

203

202

201

Sb IMAGE

Sa IMAGE

FIG. 5

304

303

302

301

Ta IMAGE

Tb IMAGE

FIG. 6

START — S1

READ OUT MEASURED DISTANCE DATA — S2

IS OBJECT LOCATED AT LONG DISTANCE MIXED WITH OBJECT LOCATED AT SHORT DISTANCE ? — S3

NO

YES

SELECT CORRESPONDING AREAS — S4

DETECT FLUCTUATION AMOUNT AT EACH AREA — S5

FLUCTUATION COMPONENT SEPARATING PROCESS — S6

EXECUTE FLUCTUATION CORRECTION OF EACH COMPONENT — S7

DETECT FLUCTUATION AMOUNT — S8

EXECUTE FLUCTUATION CORRECTION — S9

STOP — S10

FIG. 7

```
  ┌─────────────────────────────────────┐  S31
  │ START FLUCTUATION COMPONENT         │╱
  │ SEPARATING PROCESS                  │
  └─────────────────────────────────────┘
                    │
                    ▼
  ┌─────────────────────────────────────┐  S32
  │ READ OUT FLUCTUATION                │╱
  │ AMOUNT DATA                         │
  └─────────────────────────────────────┘
                    │
                    ▼
  ┌─────────────────────────────────────┐  S33
  │ EXECUTE DIFFERENCE                  │╱
  │ PROCESS                             │
  └─────────────────────────────────────┘
                    │
                    ▼
            ┌──────────────┐  S34
            │   RETURN     │╱
            └──────────────┘
```

FIG. 8

```
FLUCTUATION AMOUNT                                   SHIFT
OF OBJECT LOCATED ──────────────┐(+)─────────────▶  FLUCTUATION
AT SHORT DISTANCE                │ −                 COMPONENT
                                 │
                                 │
FLUCTUATION AMOUNT               │                   ROTATIONAL
OF OBJECT LOCATED ───────────────┴───────────────▶  FLUCTUATION
AT LONG DISTANCE                                     COMPONENT
```
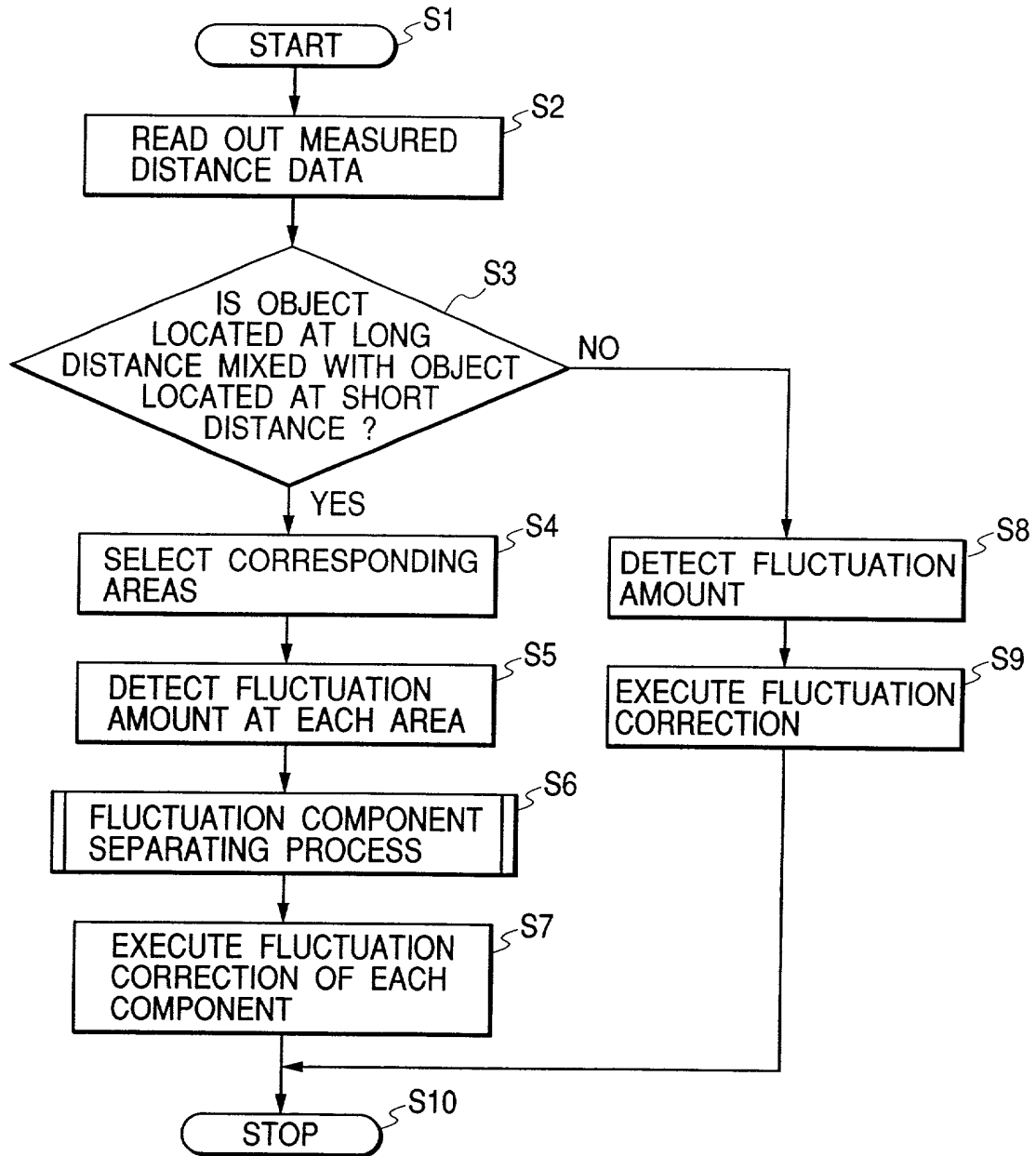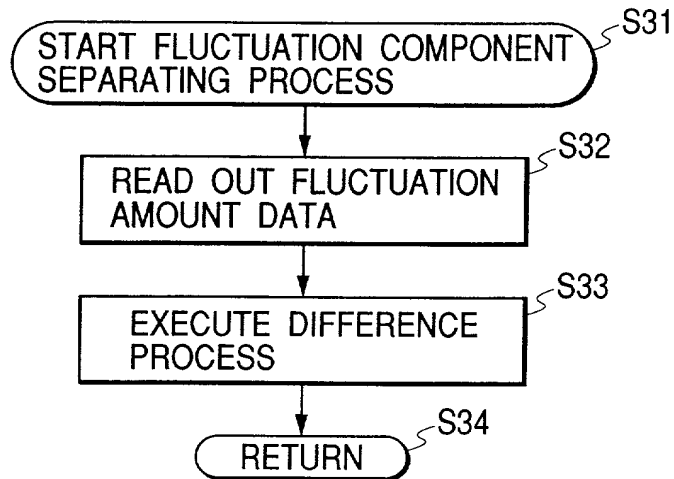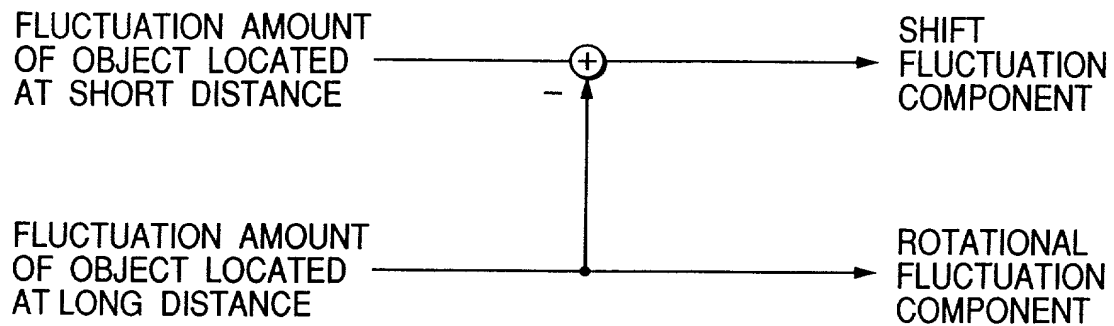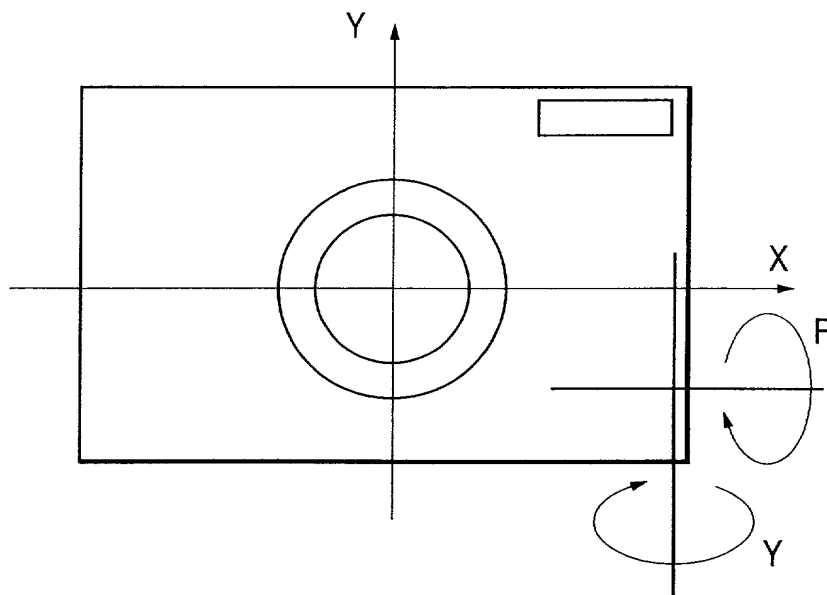
FIG. 9

COMBINED DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION
(Page 1)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled _____

__FLUCTUATION DETECTING APPARATUS AND APPARATUS WITH__

__FLUCTUATION DETECTING FUNCTION__ ,

the specification of which [X] is attached hereto [ ] was filed on _____ as United States Application No. or PCT International Application No. _____

and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b), of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designates at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT international application having a filing date before that of the application on which priority is claimed:

Country	Application No.	Filed (Day/Mo./Yr.)	(Yes/No) Priority Claimed
JAPAN	11-333728	25 November 1999	YES

I hereby appoint the practitioners associated with the firm and Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to the address associated with that Customer Number:

FITZPATRICK, CELLA, HARPER & SCINTO
Customer Number: 05514

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Full Name of Second Joint Inventor, if any _____

Second Inventor's signature _____

Date _____ Citizen/Subject of _____

Residence _____

Post Office Address _____